CUCURBIT growers are a step closer to being able to use a disease-warning system for powdery mildew, and to potentially reduce the number of fungicide applications they use per crop.

A model developed at the University of Queensland School of Agriculture and Food Sciences, Gatton has performed well in predicting high and low-risk disease alerts, and has successfully guided judicious fungicide application on a ‘spray as you need’ basis in zucchini crops. This has resulted in a reduction in the number of applications for the same level of disease control.

This important work was undertaken over four years by PhD researcher Zaiton Sapak – now plant pathology lecturer and researcher at the MARA University of Technology, Shah Alam, Selangor in Malaysia.

Ms Sapak’s research studies were carried out with her adviser Associate Professor Vic Galea at the Department of Agriculture, Fisheries and Forestry research station at Gatton, as part of a larger national project funded by HAL in partnership with DPI Victoria and DAFF Queensland.

She said the study had been conducted to explore the feasibility of reducing the number of fungicide applications used to manage powdery mildew in Queensland’s commercial cucurbit crops, including zucchini.

“The industry currently uses fungicides intensively to control powdery mildew in the crop.

“Because epidemics are driven by weather conditions, we aimed to develop a simple weather-based model based on conditions that are favourable for powdery mildew - to simulate the likely cycles of disease infection over the growing season. Studies have shown as many as seven infection cycles during a 50-day zucchini growing season in Queensland.”

She said similar models were already used for other crop diseases including ascochyta in chickpeas and field peas; downy mildew in lettuce and onions; late blight in celery; black spot in apples; and blackleg in canola.

Although more development work and testing is required in different environments, on different zucchini varieties and at different disease levels, Ms Zaiton’s model proved robust enough to simulate the severity of powdery mildew in zucchini in different growing seasons and different growing environments.

With further testing and calibration, the model also has potential to simulate powdery mildew development in other cucurbit crops such as melons and cucumbers.

Ms Sapak’s research steps were to:

- develop a weather-driven simulation model for powdery mildew in cucurbits as the first step to a warning system to manage the disease in the field;
- calibrate and validate the model against observed disease severity in zucchini crops;
- determine the ability of the model to simulate the progression of the disease in the field.
In autumn 2011, Ms Sapak evaluated the concept under field conditions by comparing fungicide sprays according to a weekly spray program (industry standard practice) once initial infection had occurred, and fungicide application based on the predictive model.

Four fungicide sprays were applied under the industry-standard approach versus three sprays applied using the model as a guide. Results indicated that the fourth spray had no effect on final disease severity at the end of the growing season.

In spring 2011, Ms Sapak ran another trial to validate the model she had developed, checking its ability to guide effective fungicide application, compared with standard industry practice. Following the standard practice of a weekly spray program after powdery mildew was first observed resulted in three sprays to the crop. Applying fungicide as indicated by the model resulted in two sprays.

Once again, results indicated that application according to a predictive model enabled a reduction in fungicide sprays.

The research also evaluated the effectiveness of new registered fungicides Vivando and Colliss when applied according to her model.

After an initial application of Vivando, the model indicated no requirement for another application until 4 weeks into the crop cycle. An application of Colliss was applied in week 7, guided by the model. At the end of the growing season (week 8) extremely low levels of disease severity were recorded. “Encouragingly, disease predictions from our model agreed well with natural disease development observed in untreated zucchini plants in the field.

"Lowest disease severity was recorded in zucchinis treated with the new fungicides Vivando and Colliss."

Crop Care technical sales representative Ed Bracey, who provided these new products for Ms Sapak’s research, said the company was committed to supporting research and development of disease-prediction models so that growers could use fungicides judiciously and effectively to grow high quality crops for the lowest possible costs.

Ms Sapak said the research indicated the model was able to effectively guide decisions about spray application for powdery mildew control.

“Growers in Queensland tend to schedule weekly fungicide sprays, alternating contact and systemic fungicides, after initial disease symptoms are observed in the crop.

“This practice does not account for the influence of environmental conditions on the risk of disease. Intensive application of fungicide in a low-risk situation is unjustified; and delaying application during a high-risk situation results in less effective control. These practices have also led to development of fungicide resistance.

“A more strategic disease management approach is a reliable disease-warning system, which can alert growers when crop conditions favour disease development; enable them to make an informed decision to protect their crop; reduce the number of fungicide sprays per crop; and minimise fungicide resistance.”

Ms Sapak’s model – POMICS – Powdery Mildew of Cucurbits Simulation has successfully predicted the natural progression of powdery mildew cycles of infection during a zucchini crop growing season, predicted disease severity, and effectively guided the application of fungicides at any recurrent disease cycle.
University of Queensland PhD researcher Zaiton Sapak has developed a model that simulates powdery mildew development in zucchini crops. Trialed in autumn and spring last year on crops at Gatton, the model enabled a reduction in fungicide applications by guiding applications according to disease risk.

Further information on this important research can be obtained from:

Professor Vic Galea  
E: v.galea@uq.ed.au

Cucurbit spray programs including the new-approach fungicides can be obtained from:

Kerrie Mackay  
National Horticulture and suSCon Business Manager  
P: 07 3909 2008 | M: 0413 458 069 | E: kerrie.mackay@cropcare.com.au